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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/536,997	05/31/2005	Shuji Yamaoka	052644	6518

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WESTERMAN, HATTORI, DANIELS & ADRIAN, LLP
1250 CONNECTICUT AVENUE, NW
SUITE 700
WASHINGTON, DC 20036

EXAMINER	
ZHU, JOHN X	
ART UNIT	**PAPER NUMBER**
2858	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	02/02/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/536,997	YAMAOKA ET AL.	
	Examiner	Art Unit	
	John Zhu	2858	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *28 November 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-26* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *15 and 26* is/are allowed.

6)☒ Claim(s) *1-14,16-25* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *31 May 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 10/27/2006 has been entered.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1, 2, 3, 7, 8, 16 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takada (6,373,258 B2) in view of Sotaro et al. (JP 2001-84905) and Yamaoka (6,825,673 B1).

With respect to claims 1, 2, 16 and 17, Takada discloses an AC board inspection probe and method for inspecting pattern lines (Fig. 1) on a circuit board comprising supply means including a supply electrode (Fig. 4, element 310) for supplying an inspection signal from the first end of pattern, detection means including a sensor

electrode (element 620) for detecting a signal from the second end of pattern, and moving means (Column 4, lines 31-32/Fig. 9, element 900) for moving the probe.

Takada does not explicitly disclose moving both supply and sensor electrodes, respectively, with a given gap relative to each of the target patterns, but rather, moving only the sensor electrode, with a given gap relative to each of the target patterns, across second end. Furthermore, Takada does not explicitly disclose the target patterns being conductive patterns formed on a circuit board having a bar-like shape with a given width. Takada also does not explicitly disclose maintaining a constant nonzero distance between the supply and sensor electrode with respect to the target pattern during inspection.

Sotaro discloses moving both the supply and sensor electrodes, respectively, with a given gap relative to each of the target patterns, across first and second ends (Abstract/Fig. 3) on a circuit board (element 11) having a bar-like shape with a given width.

Yamaoka discloses maintaining a constant nonzero distance between the supply and sensor electrode with respect to the target pattern during inspection (Fig. 5, capacitive supply and sensor electrodes).

Accordingly, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the moving means of both the supply and sensor electrodes and conductive patterns on a circuit board as taught by Sotaro into the system of Takada for the purpose of inspecting all target patterns on a circuit board, and further obvious to modify Takada to include the maintaining constant nonzero

distance between the supply and sensor electrode to the target pattern during inspection as taught by Yamaoka for the purpose of creating a complete non-contact inspection system and/or allows the system to work if for any reason the probe pins cannot be arranged on the input side (Column 7, lines 30-33).

With respect to claim 3, Takada further discloses the width of the sensor electrode has a length to cover a plurality of rows of conductive pattern lines (Claim 1).

With respect to claim 7, Takada, Sotaro and Yamaoka do not explicitly disclose the moving means is adapted to move supply and sensor electrodes under the condition that each surface of supply and sensor electrodes is capacitively coupled with each of the target patterns.

However, Takada discloses the surface of supply and sensor electrodes is capacitively coupled with the target patterns in order to test the pattern (Column 2, lines 1-8). It would have been obvious to one of ordinary skill in the art at the time the invention was made to only move the supply and sensor electrodes of Takada, Sotaro and Yamaoka under the condition that a capacitance coupling occurs for the purpose of actually testing the target pattern before moving on to test the next target pattern.

With respect to claim 8, Takada, Sotaro and Yamaoka do not explicitly disclose a range to determine if target pattern is normal when determination means output a result

that falls within the range, or target pattern is defective when the output result is out of the range.

However, Takada discloses a predetermined threshold to determine whether a disconnection is present in pattern lines. If the detected signal is much lower than the reference level, then a disconnection is present (Column 8, lines 47-55).

Accordingly, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate a range into the system of Takada, Sotaro and Yamaoka for the purpose to see how much lower the detected signal than the predetermined level has to be to indicate a defect in the pattern.

4. Claims 4, 5, 6,18, 19, 20 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takada, Sotaro and Yamaoka as applied to claims 2 and 17 above, and further in view of Hironobu (JP 05-333357).

With respect to claims 4 and 19, Takada, Sotaro and Yamaoka do not explicitly a sensor electrode includes a first sensor electrode disposed at a position opposed to the second end of one of the adjacent target patterns which has the first end supplied with the inspection signal from the supply electrode, so as to allow the detection of disconnection, and a second sensor electrode adapted to be disposed at a position opposed to the second end of a remaining one of the adjacent target patterns, so as to allow the presence of short circuit between adjacent target patterns to be determined.

Hironobu discloses a first sensor electrode (Fig. 1, element 4) disposed at a position opposed to the second end of one of the adjacent target patterns which has the

first end supplied with the inspection signal from the supply electrode (element 3) to allow the detection of disconnection and a second sensor electrode (element 5) adapted to be disposed at a position opposed to the second end of a remaining one of the adjacent target patterns to allow the detection of short circuit.

Accordingly, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the two sensor electrodes as taught by Hironobu into the system of Takada, Sotaro and Yamaoka for the purpose of detecting the presence/absence of disconnection and short-circuiting of the strip pattern (Abstract).

With respect to claims 5 and 6, Takada, Sotaro and Yamaoka do not disclose the first and second sensor electrodes having a width equal to or less than each width of target patterns.

Hironobu discloses the first and second sensor probes with electrodes widths smaller than each of the widths of target patterns (Fig. 1) contacting the patterns.

Accordingly, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the first and second sensor probes with electrode widths smaller than each of the widths of target patterns as taught by Hironobu into the system of Takada, Sotaro and Yamaoka for the purpose of making secure electrical connections with the target patterns without interference.

With respect to claim 18, T Takada, Sotaro and Yamaoka disclose all aspects of the claim including the width of the sensor electrode having a length to cover a plurality of rows of conductive pattern lines (Takada, claim 1).

Takada, Sotaro and Yamaoka do not explicitly disclose detecting a signal from one of the adjacent target patterns a remaining one of which is supplied with the inspection signal, so as to allow the presence of short circuit between adjacent target patterns to be determined.

Hironobu discloses a detection probe 5 detecting a signal from one of the adjacent target patterns a remaining one of which is supplied with the inspection signal, so as to allow the present of short circuit between adjacent target patterns to be determined (Abstract).

Accordingly, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the detection of adjacent target patterns as taught by Hironobu into the system of Takada, Sotaro and Yamaoka for the purpose of detecting the presence/absence of short circuits (Abstract).

With respect to claim 20, Takada, Sotaro and Yamaoka do not explicitly disclose determining a general position of a disconnected region in the target pattern where no detection signal is detected.

Hironobu discloses a three-probe system in which no electrical potential difference being detected by the sensor when a disconnection occurs on the target pattern and knowing the particular strip is defective since the probes are connected to it.

Accordingly, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate determination of disconnection via no detection signal as taught by Hironobu into the system of Takada, Sotaro and Yamaoka for the purpose of detecting the presence/absence of short circuits and disconnections (Abstract).

With respect to claim 21, Takada, Sotaro, Yamaoka and Hironobu do not explicitly disclose a range to determine if target pattern is normal when determination means output a result that falls within the range, or target pattern is defective when the output result is out of the range.

However, Takada discloses a predetermined threshold to determine whether a disconnection is present in pattern lines. If the detected signal is much lower than the reference level, then a disconnection is present (Column 8, lines 47-55).

Accordingly, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate a range into the system of Takada, Sotaro, Yamaoka and Hironobu for the purpose to see how much lower the detected signal than the predetermined level has to be to indicate a defect in the pattern.

5. Claims 9 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takada, Sotaro and Yamaoka as applied to claim 8 above, and further in view of Norio (JP 2000-221227).

With respect to claim 9, Takada, Sotaro and Yamaoka do not explicitly disclose second moving means for moving supply and sensor electrodes to respective positions opposed to the first and second ends of pattern and moving either one of the electrodes along defective target pattern toward the other electrode, or position detection means for detecting a position where a detection signal has a change.

Norio discloses a second moving means (Fig. 1, element 5) that moves the voltage sensor electrode and supply electrode along defective target patterns (element 2) and position detection means for detecting a position along the x-axis when the voltage detected by the voltage sensor changes (Fig. 5-7).

Accordingly, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the second moving means and position detection means as taught by Norio into the system of Takada, Sotaro and Yamaoka for the purpose of locating/positioning the failure of the disconnection or the short-circuit (Abstract).

With respect to claim 10, although Takada, Sotaro and Yamaoka do not explicitly disclose contact means for bringing either one of supply and sensor electrodes into contact with defective target pattern, it is inherent that some sort of contact means (either manual or automatic) must be present in order to allow the contact of the supply

means to the pattern for the purpose of injecting the pattern with test currents for testing.

6. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Takada, Sotaro, Yamaoka and Norio (JP 2000-221227) as applied to claim 9 above, and further in view of Kawaike et al. (6,937,035 B2).

With respect to claim 11, Takada, Sotaro, Yamaoka and Norio do not explicitly disclose image pickup means included with electrodes.

Kawaike discloses circuit board inspection including image pickup means via visual recognition device (Column1, lines 26-27).

Accordingly, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the image pickup means as taught by Kawaike into the system of Takada, Sotaro, Yamaoka and Norio for the purpose of visually inspecting circuit boards for defects (Column 1, lines 29-38).

7. Claims 12, 13 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takada, Sotaro, Yamaoka and Norio as applied to claims 2 and 9 above, and further in view of Tanaka et al. (5,241,276).

With respect to claims 12 and 13, Takada, Sotaro, Yamaoka and Norio do not disclose gap control means for positioning at least one of the electrodes in such a manner as to allow a gap between at least one electrode and target pattern to be maintained at an approximately constant value.

However, as one of ordinary skill in the art would know, it is obvious to keep a gap as constant as possible in a capacitive sensor because any variation in a gap would cause different measurement results. Furthermore, Tanaka discloses a surface potential capacitive measuring system comprising means for keeping a gap between one electrode and target sample substantially constant (Claim 3).

Accordingly, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the means for keeping a gap constant as taught by Tanaka into the system of Takada, Sotaro, Yamaoka and Norio for the purpose of more accurate measuring results.

With respect to claim 14, Takada, Sotaro, Yamaoka and Norio do not disclose a displacement measurement device with the gap control means with the gap control means being operable to position the sensor in a direction orthogonal to the inspection region with a detection result to allow a gap between sensor and inspection region to be maintained at an approximately constant value.

Tanaka discloses a displacement sensor measurement device (Fig. 5, element 47) connected to the probe structure and electrode (elements 34 and 11) that allows a gap between the electrode and inspection region to be maintained at a constant distance. Although Tanaka does not explicitly the disclose the displacement measurement device at a position adjacent to the sensor and adapted to moved together with sensor, it would have been obvious to one of ordinary skill in the art at the time the invention was made to integrate the displacement measurement device with

the movable sensor to measure displacement even when the sensor is moved to different positions.

Accordingly, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the displacement measurement device as taught by Tanaka into the system of Takada, Sotaro, Yamaoka and Norio for the purpose of controlling the distance between the probe and the device under test based on measured results.

8. Claims 22 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takada, Sotaro, Yamaoka and Hironobu as applied to claim 21 above, and further in view of Norio (JP 2000-221227).

With respect to claim 22, Takada, Sotaro, Yamaoka and Hironobu do not explicitly disclose specifying a position of defective pattern and storing information, moving electrodes to respective positions opposed to the ends in accordance with stored information, moving either one of the electrodes to area of defective location, and detecting a position of defective pattern based on change of detection results.

Norio discloses a second moving means (Fig. 1, element 5) that moves the voltage sensor electrode and supply electrode along defective target patterns (element 2) and position detection means for detecting a position along the x-axis when the voltage detected by the voltage sensor changes (Fig. 5-7).

Accordingly, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the second moving means and position

detection means as taught by Norio into the system of Takada, Sotaro, Yamaoka and Hironobu for the purpose of locating/positioning the failure of the disconnection or the short-circuit (Abstract).

With respect to claim 23, although Takada, Sotaro, Yamaoka and Hironobu do not explicitly disclose contact means for bringing either one of supply and sensor electrodes into contact with defective target pattern, it is inherent that some sort of contact means (either manual or automatic) must be present in order to allow the contact of the supply means to the pattern for the purpose of injecting the pattern with test currents for testing.

9. Claim 24 is rejected under 35 U.S.C. 103(a) as being unpatentable Takada, Sotaro, Yamaoka, Hironobu and Norio as applied to claim 22 above, and further in view of Kawaike et al. (6,937,035 B2).

With respect to claim 24, Takada, Sotaro, Yamaoka, Hironobu and Norio do not explicitly disclose image pickup means included with electrodes and moving pickup means together with at least one electrode along defective pattern.

Kawaike discloses circuit board inspection including image pickup means via visual recognition device (Column1, lines 26-27).

Accordingly, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the image pickup means with electrodes as

taught by Kawaike into the system of Takada, Sotaro, Yamaoka, Hironobu and Norio for the purpose of visually inspecting circuit boards for defects (Column 1, lines 29-38).

10. Claim 25 is rejected under 35 U.S.C. 103(a) as being unpatentable over Takada, Sotaro, Yamaoka and Hironobu as applied to claim 18 above, and further in view of Tanaka et al. (5,241,276).

With respect to claim 14, Takada, Sotaro, Yamaoka and Hironobu do not disclose a displacement measurement device with the gap control means with the gap control means being operable to position the sensor in a direction orthogonal to the inspection region with a detection result to allow a gap between sensor and inspection region to be maintained at an approximately constant value.

Tanaka discloses a displacement sensor measurement device (Fig. 5, element 47) connected to the probe structure and electrode (elements 34 and 11) that allows a gap between the electrode and inspection region to be maintained at a constant distance. Although Tanaka does not explicitly the disclose the displacement measurement device at a position adjacent to the sensor and adapted to moved together with sensor, it would have been obvious to one of ordinary skill in the art at the time the invention was made to integrate the displacement measurement device with the movable sensor to measure displacement even when the sensor is moved to different positions.

Accordingly, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the displacement measurement device as

taught by Tanaka into the system of Takada, Sotaro, Yamaoka and Hironobu for the purpose of controlling the distance between the probe and the device under test based on measured results.

Allowable Subject Matter

11. Claims 15 and 26 allowed.

12. The following is a statement of reasons for the indication of allowable subject matter: claims 15 and 26 are allowable over the art of record because the prior art does not teach or suggest a circuit pattern inspection apparatus and means with gap control operable to position sensor or supply electrode in a direction orthogonal to inspection region on the basis of a gap defined by an average displacement of a detection result obtained from a plurality of pitches of target patterns.

Response to Arguments

13. Applicant's arguments with respect to claims 1 and 16 have been considered but are moot in view of the new ground(s) of rejection.

The reference of Yamaoka is used to show that in addition to conventional conductive pattern inspection systems with a contact supply electrode and non-contact sensor electrode, systems that are completely non-contact (capacitive) in nature can also be used to detect defects and faults.

Conclusion

14. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Ishioka et al. (6,703,849 B2) discloses a similar inspection system that utilizes non-contact supply and sensor electrodes.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to John Zhu whose telephone number is (571) 272-5920. The examiner can normally be reached on M-F, 8-4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Andrew Hirshfeld can be reached on (571) 272-2168. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

John Zhu
Examiner
Art Unit 2858

JZ

ANDREW H. HIRSHFELD
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800